

2016 Fish Tissue Contaminants Monitoring Workplan

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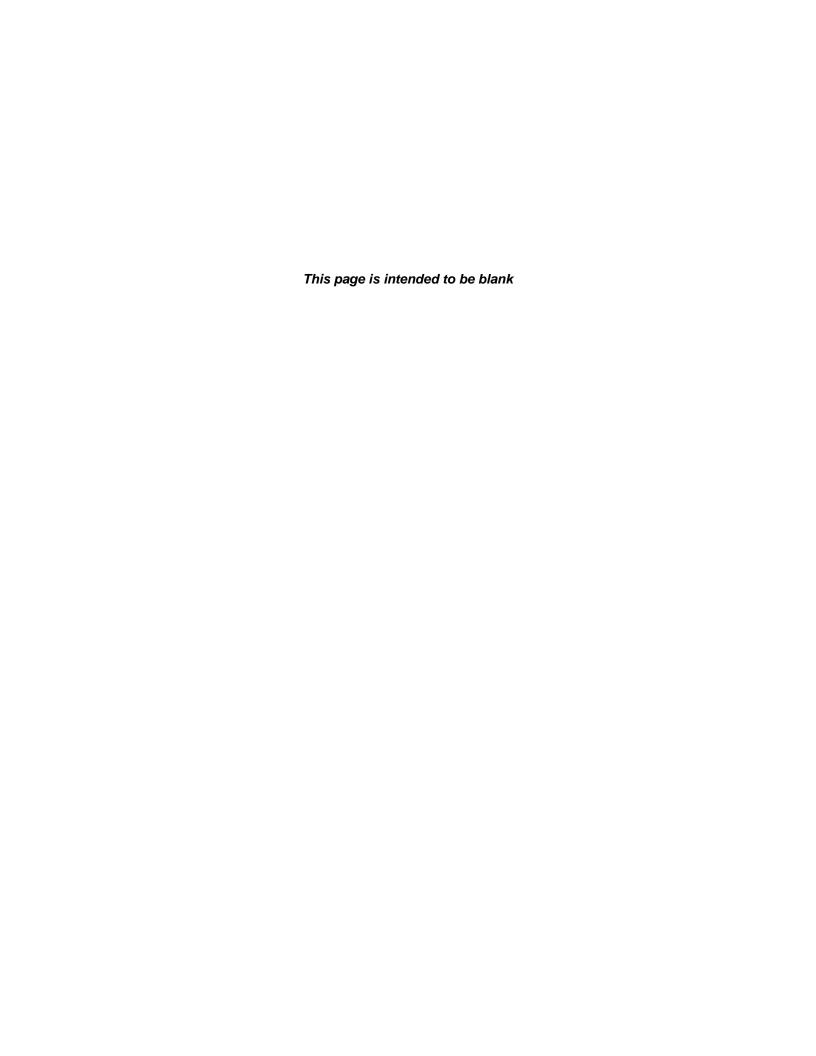
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Office of Water Quality
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Workplan Organization

This Sampling and Analysis Work Plan is an extension of the existing Watershed Assessment and Planning Branch, October 2004 "Quality Assurance Project Plan (QAPP) for Indiana Surface Water Quality Monitoring and Total Maximum Daily Load (TMDL) Program" and serves as a link to the existing QAPP and an independent QAPP for the project. Per the United States Environmental Protection Agency (U.S. EPA) 2006 QAPP guidance (U.S. EPA 2006), this Work Plan establishes criteria and specifications pertaining to a specific water quality monitoring project that are usually described in the following four sections as QAPP elements:

Section I. Project Management/Planning

- Project Objectives
- Project/Task Organization and Schedule
- Background and Project/Task Description
- Data Quality Objectives (DQOs)
- Training and Staffing Requirements

Section II. Measurement/Data Acquisition

- Sampling Procedures
- Analytical Methods
- Sample and Data Acquisition Requirements
- Quality Control (QC) Measures Specific to the Project

Section III. Assessment/Oversight

- External and Internal Checks
- Audits
- Data Quality Assessments (DQAs)
- Quality Assurance/Quality Control (QA/QC) Review Reports

Section IV. Data Validation and Usability

- Data Handling and associated QA/QC activities
- QA/QC Review Reports

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LIST OF ACRONYMS

AIMS: Assessment Information Management System

ALUS: Aquatic Life Use Support

AOC: Area of Concern AU: Aquatic Uses

AVS: Acid Volatile Sulfides
BSS: Biological Studies Section
BUI: Beneficial Use Impairment
CAS: Chemical Abstract Service
CFR: Code of Federal Regulations

CLP: U.S. EPA Contract Laboratory Program

CPR: Cardio-Pulmonary Resuscitation
CRQL Contract Required Quantitation Limits

CWA: Clean Water Act C: Degrees Celsius

DFW Division of Fish and Wildlife

DL: Detection limit

DQA: Data Quality Assessment
DQO: Data Quality Objective
EDI: Electronic data interchange
EQL: Equipment Quantitation Limit
FCA: Fish Consumption Advisory

gm: Grams

GPP: Generator Powered Pulsator

HUC: Hydrologic Unit Code

IAC: Indiana Administrative Code

IC: Indiana Code

IDEM: Indiana Department of Environmental Management

IDNR: Indiana Department of Natural Resources
ISDH: Indiana State Department of Health

IUPAC: International Union of Pure and Applied Chemistry

MDL: Method Detection Limit

mm: Millimeters

MS/MSD: Matrix Spike/Matrix Spike Duplicate

NA: Not applicable

ng/kg: Nanograms per kilogram

NHD: National Hydrography Database

NPDES: National Pollutant Discharge Elimination System

OWQ: Office of Water Quality

PAH: Polycyclic (or polynuclear) Aromatic Hydrocarbons

PBDE: Polybrominated diphenyl ether PCB: Polychlorinated biphenyl PFD: Personal Floatation Device

PPA: Performance Partnership Agreement PPE: Personal Protective Equipment

RAP: Remedial Action Plan QA: Quality Assurance

QA/QC: Quality Assurance/Quality Control
QAC: Quality Assurance Coordinator
QAM: Quality Assurance Manager
QAO: Quality Assurance Officer

QC: Quality Control

QAPP: Quality Assurance Project Plan QMP: Quality Management Plan

RFP: Request for Proposals
RL: Laboratory Reporting Limit
RPD: Relative Percent Difference
SOP: Standard Operating Procedure

S.U.: Standard Units

SWQMS Surface Water Quality Monitoring Strategy

TMDL: Total Maximum Daily Load TOC: Total Organic Carbon micrograms per kilogram

U.S. ACE United States Army Corps of Engineers

U.S. EPA: United States Environmental Protection Agency

U.S. FWS: United States Fish and Wildlife Service

U.S. GS: United States Geological Survey

WAPB: Watershed Assessment and Planning Branch WQMS: Indiana Water Quality Monitoring Strategy

WW: Wet Weight

DEFINITIONS

Bioaccumulate The accumulation of a substance, such as a toxic

chemical, in various tissues of a living organism.

Co-jurisdictional waters According to 312 IAC 5-2-47, the Indiana waters of

Lake Michigan, the Ohio River, the Wabash River (where it forms the Indiana-Illinois border), and the Great

Miami River.

Composite Fish Sample A fish tissue sample comprised of 2 or more individual

organisms of the same species collected at a particular site, of similar size (smallest individual within the composite is no less than 75% of the total length of the

largest individual), and analyzed as a single sample.

Contaminant A biological, chemical, physical, or radiological

substance which, in sufficient concentration, can adversely affect living organisms through air, water, soil,

and/or food.

Emerging Contaminant New compounds or molecules that were not previously

known or that just recently appreared in the scientific literature; contaminants of emerging interest which were

known to exist but for which the environmental contamination issues were not fully realized or

apprehended, and; emerging issues about "old" (legacy) contaminants (i.e. situations where new information is jostling our understanding of environmental and human health risks related to "old" contaminants) (Sauve, 2014).

Fillet The flesh of the fish, which is composed of the skeletal

muscles and fat, as opposed to the bones and internal

organs.

Hydrologic Unit Code (HUC)

A numbering system for watersheds, based on the area

of land that drains into a hydrologic feature such as a

stream, river, or lake.

Jon boat A simple flat-bottomed boat, constructed of aluminum,

fiberglass, or wood, which is suitable for fishing and

hunting in calm or shallow waters.

Legacy Contaminant Pollutants, often used or produced by industry, which

remain in the environment long after they were first

introduced.

Piscivorous A carnivorous animal which eats primarily fish.

Replicate Sample Two or more composite samples containing the same

species, of similar length, from the a particular site, and having a relative difference between the average lengths of individuals within any composite sample of less than

10 percent (U.S. EPA 2000c, 6.1.2.7).

Total Length

A measurement from the anterior-most part of the fish to the longest caudal fin ray when the lobes of the caudal fin are compressed dorsoventrally (U.S. EPA 2000c).

I. PROJECT MANAGEMENT/PLANNING

Project Objective

Indiana Environmental Statute IC 13-11-2-260 defines water pollution as:

- 1) the actual or threatened alteration of the physical, thermal, chemical, biological, bacteriological, or radioactive properties of any waters; or
- 2) the discharge or threatened discharge of any contaminant into any waters that does or can create a nuisance or make the waters harmful, detrimental, or injurious to any of the following:
 - (A) Public health, safety, or welfare.
 - (B) Domestic, commercial, industrial, agricultural, recreational, or other legitimate uses.
 - (C) Livestock, wild animals, birds, fish, or aquatic life.

The goal of the State of Indiana is to restore and maintain the chemical, physical, and biological integrity of the waters of the State (327-IAC-2-1-1.5). In furtherance of this primary goal: 1) it is the public policy of the State that the discharge of toxic substances in toxic amounts be prohibited; and 2) it is the public policy of the State that the discharge of persistent and bioconcentrating toxic substances be reduced or eliminated.

Section 106(e) of the Clean Water Act (CWA) and 40 CFR Part 35.168(a) require the United States Environmental Protection Agency (U.S. EPA) to determine that a state is monitoring the quality of navigable waters, compiling, and analyzing data on water quality and including it in the State's Section 305(b) report. The Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ) is responsible for sampling and assessing Indiana's surface water quality pursuant to the CWA Section 305(b) as well as, according to Section 303(d) of the CWA, identifying water bodies of the state that are impaired and need development of a Total Maximum Daily Load (TMDL) to alleviate the impairments. To that end, all states must submit a biennial Integrated Water Quality Monitoring and Assessment Report (Integrated Report) (IDEM 2012a), encompassing the 305(b) assessment report and the 303(d) list of impaired water bodies (IDEM 2012d) to the U.S. EPA.

The U.S. EPA has made recommendations on the basic elements of a state water monitoring program. Fish tissue contaminants and sediment contaminants monitoring are included in U.S. EPA's recommendations as elements of a state water monitoring assessment program (U.S. EPA 2003). The U.S. EPA Office of Water generally believes that fish and shellfish consumption advisories, based on water body specific information, demonstrates an impairment of the Section 101(a) CWA goal of restoring and maintaining the biological integrity of the Nation's waters. This applies to fish and shellfish consumption advisories for all pollutants that constitute potential risks to human health, regardless of the source of the pollutant (U.S. EPA 2003).

Section 101(a)(2) of the CWA establishes as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water," wherever attainable. These are commonly referred to as "fishable/swimmable" goals of the CWA. The U.S. EPA's water quality standards regulations interpret and implement these provisions by requiring water quality standards that, at a minimum, provide for fishable/swimmable uses (unless those uses have been shown to be unattainable), and requiring adoption of water quality criteria that protect the designated uses. The U.S. EPA interprets "fishable" uses under section 101(a) of the CWA to include, at a minimum, designated uses providing for the protection of aquatic communities and human health related to consumption of fish and shellfish. In other words, U.S. EPA views "fishable" to mean that, not only can fish and shellfish thrive in a water body but, when caught, can also be safely eaten by humans. This interpretation also satisfies the Section 303(c)(2)(A) requirement that water quality standards protect public health.

While numeric human health criteria for ambient water column concentrations of pollutants are a basis for determining impairment, the attainment of such criteria does not always mean that

designated uses are being protected. Conventional analytical chemistry is not always capable of measuring low levels of contaminants such as mercury and polychlorinated biphenyls (PCBs) in water. Water body specific factors sometimes cause pollutants to bioaccumulate in fish and shellfish tissue at higher levels than predicted by the methodology used to derive the numeric human health criteria. This includes pollutant accumulations in the sediments as well. Hence, a water body can be meeting numeric ambient water quality criteria, but not attaining the designated uses because fish or shellfish tissue concentrations exceed levels that are protective of human health.

Under Section 303(d)(1), Indiana must identify water bodies that are not meeting designated aquatic life uses, and prioritize such water bodies for TMDL establishment. Although the CWA does not explicitly direct the use of fish and shellfish contaminants data in determining attainment of the use designations in the water quality standards, Indiana is required to consider all existing and readily available data and information (40 CFR 130.7) to identify impaired water bodies for the 303(d) list. For purposes of determining whether a water body is impaired and should be included on the 303(d) list, U.S. EPA considers a fish or shellfish consumption advisory, and the supporting data, to be existing and readily available data, and information that demonstrates non-attainment of the Section 101(a) "fishable" goal. This applies to any pollutants that pose potential risks to human health, regardless of the source of the pollutant, and forms the basis for the Indiana Fish Consumption Advisory (FCA). Assessment of fish consumption is a recommended "core" indicator element of a monitoring program (U.S. EPA 2003).

The Indiana Water Quality Monitoring Strategy: 2011-2019 (WQMS) (IDEM 2010a) facilitates accomplishing these CWA requirements, in addition to other IDEM-specific management goals. The fish tissue contaminants monitoring program samples the state on a five-year cycle so that its fifth cycle will begin for this program in 2016. Assessments of the state's waters are facilitated by various Watershed Assessment and Planning Branch programs involving probabilistic and targeted approaches by collecting biological, chemical, physical, and habitat data.

Study Area for the 2016 Monitoring Program

The Fish Tissue Contaminants Monitoring Program is a component of the WQMS designed to assess bioaccumulating contaminants in fish. For the 2016 program year, 40 sites from the West Fork White River and Patoka River basins, and four sites from the Grand Calumet River (GCR) will be the focus of sampling efforts. In addition, the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife (DFW) will collect fish tissue samples, to be processed by the IDEM OWQ Watershed Assessment and Planning Branch (WAPB) from the Indiana waters of southern Lake Michigan during their planned studies. Salmonid species targeted for collection from the Indiana waters of southern Lake Michigan in 2016 include Coho salmonids (*Oncorhynchus kisutch*). The IDNR targets collection of two replicate samples of three different size classes of Coho salmon following the U.S. EPA Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories (U.S. EPA 2000c, Section 6).

Fish tissue contaminant monitoring provides tools that measures contaminants in Indiana's environment that may not be effectively detected in ambient water or air samples. Tissue contaminant monitoring, as part of an integrated multi-media monitoring program, gives insight into exposure levels and allows IDEM to better develop its understanding of the complexities of contaminant distribution, fate, and effects.

The specific objectives of the Fish Tissue Contaminants Monitoring Program are to:

- Generate results for use as ecological indicators in support of the Performance Partnership Agreement (PPA), CWA § 305(b) reporting and § 303(d) listing of impaired waters.
- Gather data to support the issuance, modification, or removal of fish consumption advisories on Indiana waters for human health protection.

- Develop tools for regional assessment and classification of bioaccumulating contaminants in Indiana waters.
- Provide supporting data toward understanding risks to piscivorous wildlife.
- Evaluate contaminant trends in fish.

Project/Task Organization and Schedule

The primary objective of this program is to provide data to support CWA § 305(b) reporting on the quality of Indiana's waters and for the listing of those waters not meeting their designated uses under § 303(d). That data also will be used by the Interagency Fish Consumption Advisory Workgroup to make recommendations for the issuance, modification, or removal of fish consumption advisories for specific water bodies by the Indiana State Department of Health (ISDH). In 2016, tributaries to the West Fork White River and Patoka basins in Indiana are the regions of central focus for these two objectives. These are the target basins for monitoring and assessment within the Office of Water Quality Water Monitoring Strategy for fish tissue contaminants monitoring. For the purpose of this project, the tributaries to the West Fork White River Basin are defined as all streams, rivers, reservoirs and natural lakes discharging to or within the defined watershed boundaries of the Eel River and the Upper and Lower White River. Tributaries to the Patoka River Basin include all streams, rivers, reservoirs and natural lakes discharging to or within the watershed boundaries of the Patoka River. In addition, fish tissue samples from the Grand Calumet River will be collected in support of the Remedial Action Plan (RAP) for the Grand Calumet River/Indiana Harbor Canal Area of Concern (AOC), and fish tissue samples from the Indiana waters of southern Lake Michigan near Michigan City, will be collected by the IDNR DFW and submitted for analysis to the analytical services contract laboratory (IDOA 2013) by IDEM OWQ WAPB personnel. Sampling by IDEM OWQ WAPB for the target basins portion of this project will begin in June and continue through October. All fish collections submitted by the IDNR will be on their own schedule and following their own sampling protocols and TSOPs. Sample selection and sample processing by the IDNR is further explained in the Background and Project/Task Description section of the workplan.

Deadlines and Time Frames for Sampling Activities

- a. <u>Site reconnaissance</u> activities for all listed tentative sites will begin in January and conclude by the beginning of the sampling season. Reconnaissance activities will be conducted in the office and through physical site visits if needed. The office activities will include preparation and review of site maps and aerial photographs, potential access routes and property owner searches when necessary. Landowner permission is required when access to a site is located on private property. Physical site visits will include property owner visits (if necessary), as well as confirmation and documentation of access routes and equipment needs. The Sampling Design and Site Locations section of this workplan contains more detailed information about site selection.
- b. Fish tissue collection activities will begin in June and end in October 2016. The annual monitoring program target is for approximately 35-45 sites from the target basins to be sampled once during the course of the sampling season. There are 40 West Fork White River and Patoka basin sites, including thirty-four stream or river sites and six reservoirs, and one site from the Indiana waters of southern Lake Michigan from which fish tissue samples will be collected. In addition, four sites will be sampled on the GCR in Lake County to support the data collection efforts for the remedial action plan. The total number of composite fish tissue samples collected from the list of 45 sites in Table 2 is expected to be about 200. These samples are prepared from approximately 500 individual captured fish.
- c. <u>Fish collected and prepared for individual or composite fish tissue samples</u> are stored in a freezer in the WAPB laboratory room 125, 124, or building 41 laboratory at the Western

Select Properties office building (2525 N. Shadeland Ave, Indianapolis, IN 46219) until relinquished to the contract analytical services laboratory for analysis. Prepared samples are not sent to the laboratory until all sampling sites for that year have been completed.

- d. Records of all composite samples collected are entered into the project field sample record book by the IDEM OWQ WAPB fish tissue sampling crew leader. This is an activity that is done in the field at the time of sampling. This book is kept at the IDEM OWQ WAPB Western Select Properties field office in the custody of the project manager or sampling crew leader.
- e. <u>All accounts of the sampling event</u>, sample collection crew, samples collected, preparation of samples, species, number of individuals composited in the sample, individual fish lengths, and individual fish weights are entered into the Assessment Information Management System (AIMS) Project: "**2016 Fish Tissue**" by the project manager, sampling crew chief, or any other staff person specifically designated by the project manager or sampling crew chief. This is ongoing and completed before shipment of samples to the analytical services contract laboratory.

Background and Project/Task Description

Fish tissue and sediment contaminants monitoring have been a regular part of the Watershed Assessment and Planning Branch activities since the early 1970s with the then Indiana State Board of Health. Fish tissue contaminant monitoring was first incorporated into the rotating basin methodology in 1997. The program currently follows a five year rotating basin schedule, in which all basins are visited every five years. This schedule is described in the 2011-2019 SWQMS. A 23-site sampling network subset ("core" Sites) of Fixed Station Program sites began in the late 1970s in cooperation with the U.S. EPA. Prior to 1997, fish tissue samples were collected at these 23 "core" sites on a biennial basis. Post 1997, sampling has been conducted at these sites once every five years according to the SWQMS rotating basin methodology. In addition to the 23 "core" sites, other sites are targeted based on historical environmental problems, water body access, use for fishing, percentage of unassessed stream miles per 10-digit hydrologic unit code (HUC), and recommendations for monitoring by other agencies and entities. On average, sampling targets approximately 35-45 sites, including any "core" sites in the target basin (see Table 2) annually, with an average of 4-5 fish tissue samples collected per site. In addition to this, samples from other agencies are accepted that were collected, prepared and preserved using the same techniques as used by WAPB in support of the goals of the program. Fish tissue samples are also sometimes collected by other offices or agencies for analysis under our analytical services contract (IDOA 2013) in support of specific projects such as mercury fate and transport, trends and status, and natural resource damage assessments. Samples are prepared using the whole fish or from the edible portion (skin-on or skin-off fillets) of fish. Whether whole fish or fillets are used is dependent on the size and species of fish retrieved. Typically, whole fish are only used when processing non-carp minnow species and/or fish less than or equal to 4 inches in length.

In addition to determining Aquatic Life Use Support (ALUS) attainment, another major objective of Indiana's fish tissue monitoring is to provide data in support of Indiana's FCA. The FCA provides the fish consumer with information about the risks associated with consuming potentially contaminated fish caught in Indiana. This program helps consumers make informed decisions regarding the size and species of fish and how often to eat sport caught and commercially bought fish. Each year, members of the Indiana Interagency FCA Workgroup from ISDH, IDEM, and IDNR meet to discuss the findings of recent fish monitoring data and develop the updated statewide FCA. Indiana's FCAs are issued by ISDH. IDEM collects and manages the majority of the data used to make decisions on FCAs for the state. IDNR has been instrumental in the collection of fish tissue samples from Lake Michigan and a number of inland lakes where special studies

are conducted by their agency. Fish tissue samples are collected throughout Indiana from public waters (waters of the state).

Indiana's sport fish consumption advisories are currently based on concentrations of mercury and/or PCBs found in the edible portions of fish tissue. During the last three decades, more than 5,600 fish tissue samples have been analyzed for PCBs, organochlorine pesticides, and metals of concern. Of those, the majority contained quantifiable levels of mercury. Criteria for PCBs and mercury assessments in the Indiana FCA were developed from recommendations by the Great Lakes Sport Fish Advisory Task Force; in 1993 for PCBs (Anderson et al. 1993), and in 2007 for mercury (McCann and Anderson 2007). Currently PCBs and mercury are the only two bioaccumulating fish tissue contaminants that are causing FCA listings.

Because bioaccumulating contaminants in sediments are strongly associated with levels found in fish and can aid in determining the potential origins and extent of contamination, surficial (surface or top layer) sediment sampling was, in the past, conducted in conjunction with fish tissue sampling in order to establish possible contaminant sources. Contaminants found in surficial sediments only represent contaminant presence; they do not give a measure of the total load of the contaminant in the system. Sediment sampling targets depositional areas for fine silt and organic deposits. Three or more grabs of surficial deposits are taken using a Ponar dredge (lakes and deep river pools) or scooped with a stainless steel ladle (shallow wadable waters). While sediment sampling has not been conducted as part of this program since 2003 (due to staffing priorities, analytical services contract execution timing, and the lack of progress with sediment contaminant criteria development by U.S. EPA), the OWQ WAPB retains the ability to sample this matrix on an as-needed basis. Sediment sampling will not be further discussed in this work plan.

Data Quality Objectives (DQO)

The Data Quality Objectives (DQO) process is a planning tool for data collection activities. It provides a basis for balancing decision uncertainty with available resources. The DQO is required for all significant data collection efforts for a project and is a seven step systematic planning process used to clarify study objectives, define the appropriate types of data, and establish decision criteria to base the final use of the data. The DQO process for the Fish Tissue Contaminant Monitoring Program is identified in the following seven steps.

1. State the Problem

Indiana is required to assess all waters of the state to determine their designated use attainment status. "Surface waters of the state are designated for full-body contact recreation and will be capable of supporting a well-balanced, warm water aquatic community" [327 IAC 2-1-3] and [327 IAC 2-1.5-5]. This project will gather data on bioaccumulating contaminants in fish for the purpose of assessing the designated use attainment status of streams and lakes sampled for federal purposes as required for 305(b) and 303(d) list development, human health risks associated with fish consumption, and fate and wildlife impacts of contaminants in fish.

2. Identify the Decision

The primary goals of this project are to:

Determine the aquatic life use impairment for fish consumption based on concentrations of total PCBs and mercury for the 305(b)/303(d) Integrated Report on water quality in the State of Indiana. Sites not attaining aquatic life use support for fish consumption will be listed in the Section 303(d) List of Impaired Waterbodies for Indiana. (303(d) List Category 5B: "The waters are impaired due to the presence of mercury and/or PCBs in the edible tissue of fish collected from them at levels exceeding Indiana's human health criteria for these contaminants.")

- Provide supporting data to the ISDH for the issuance, modification or removal of FCA's on waters of the State. See Table 1 for decision rules concerning total PCB and total mercury.
- Provide data that may lead to the removal of six of the current 12 Beneficial Use Impairments (BUIs) listed for the GCR and assess whether the surface waters in this watershed are fully supporting or non-supporting for aquatic life use.

Table 1: Criteria for Decision Making Using Fish Tissue

Parameter	IDEM Derived Criteria values for 303(d) ALUS* Determination	Indiana Fish Consumption Advisory decision levels (µg/kg wet weight)	
Total PCB	>20 (µg/kg wet wt.)	>50 - 1900 limited consumption >1900 No consumption	
Total mercury	>300 (µg/kg wet wt.)	>50 – 950 limited consumption for sensitive populations [®] >950 NO consumption [®] >160 limited consumption for the general population	

^{*} ALUS=Aquatic Life Use Support

A number of "legacy" bioaccumulating organochlorine compounds, metals, semi-volatile organic compounds and other "emerging" contaminants may be determined on select samples from the targeted sites based on the annual budget, regional trends in "emerging" contaminants, and historical site knowledge.

3. Identify the Decision

Field activities are required to collect whole or edible portions of representative fish species tissue samples. These samples are needed to address the necessary decisions previously described. Sampling activities will take place at targeted sites where public access is available or for which permission to access has been granted by the necessary landowners or property managers. Collection procedures for fish tissue samples will be described in detail under Section II, Measurement/Data Acquisition.

4. Define the Boundaries for the Study

For the purpose of this program, the Patoka River Basin (Figure 1) is geographically defined as the area contained by the 8-digit HUC 05120209.

The Patoka River Basin, located in southwestern Indiana, drains approximately 859 square miles to the Wabash River. Major tributaries in this basin include Hall Creek, Hunley Creek, and Flat Creek. Predominant land uses are forest (44%), cropland (32%), pasture (11%), and urban (6%) (Yang, 2013]).

[®]Sensitive populations include women under age 50, women who are pregnant, breastfeeding or planning to become pregnant, people with compromised immune systems, and children under the age of 18.

For the purpose of this program, the West Fork and Lower White River Basin (Figure 2) is geographically defined as the area contained by the 8-digit HUCs 05120201, 05120202, and 05120203 (excludes the East Fork White River Basin).

The Upper White sub-basin (HUC 05120201), located in central Indiana, drains approximately 2721 square miles upstream from the mouth of Bean Blossom Creek in Monroe County. Major tributaries in this sub-basin include Buck Creek, Killbuck Creek, Pipe Creek, Cicero Creek, Fall Creek, Eagle Creek, and White Lick Creek. Predominant land uses are cropland (53%), urban (26%), and forest (12%) (Yang, 2013).

The Eel sub-basin (HUC 05120203), located in central Indiana, drains approximately 1200 square miles to the West Fork White River. Major tributaries in this sub-basin include Mill Creek and Big Walnut Creek. Predominant land uses are cropland (55%), forest (29%), pasture (8%), and developed land (6%) (Yang, 2013).

The Lower White sub-basin (HUC 05120202), located in southwestern Indiana, drains approximately 1700 square miles. Major tributaries in this sub-basin include Bean Blossom Creek, Fish Creek, Richland Creek, Black Creek, and Prairie Creek. Predominant land uses are cropland (42%), forest (39%), pasture (8%), and developed land (6%) (Yang, 2013)

The GCR is a 13-mile long stream located in Lake County in northwestern Indiana (U.S. EPA 2012). The GCR watershed in Indiana drains 70 square miles of the cities of East Chicago, Gary, Hammond, and Whiting. The physical boundary of the GCR watershed is Lake Michigan to the north, the Illinois border to the west, Interstate Highway I-80/94 to the south, and Interstate Highway I-65 to the east. See Figure 3 for the GCR sampling area and Table 2 for the list of sampling locations.

The target area for sampling is defined as any waters of the state (stream, reservoir or natural lake) within the geographic boundaries of Indiana. Figures 1-3 and Table 2 list the sampling sites selected in the tributaries to the West Fork White River basin, the Patoka River basin, and the Indiana waters of southern Lake Michigan, respectively, for the 2016 fish tissue monitoring field season.

West Fork White River Basin

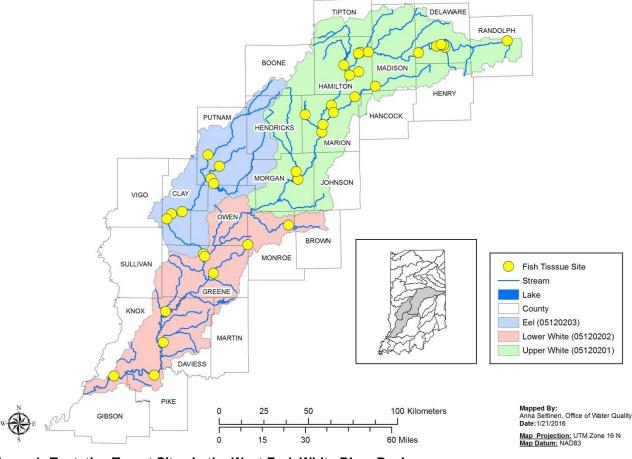


Figure 1: Tentative Target Sites in the West Fork White River Basin.

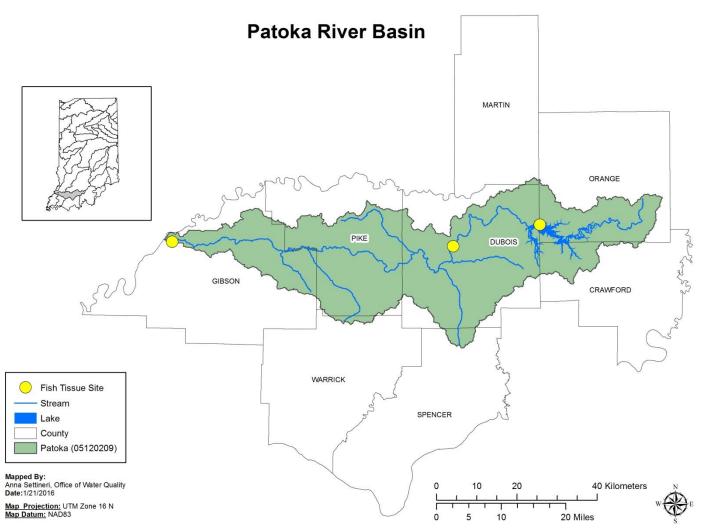


Figure 2: Tentative Target Sites in the Patoka River Basin.

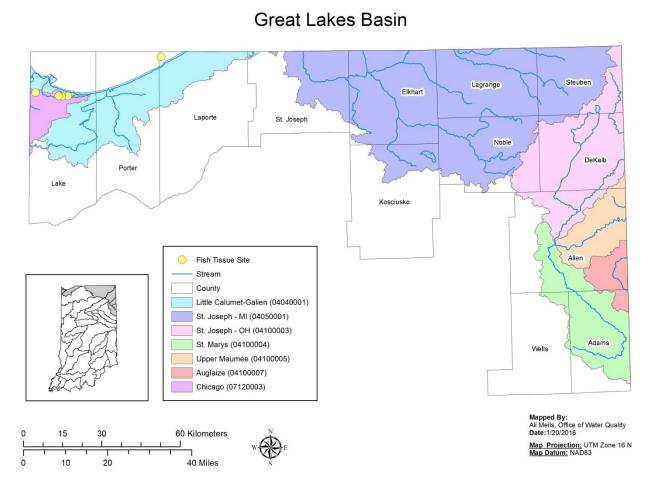


Figure 3: Tentative Target Sites in the Indiana Portion of Southern Lake Michigan and the Grand Calumet River.

Table 2: Tentative Target Sites for the 2016 Fish Tissue Contaminants Monitoring Program

Site ID	Location	County	Waterbody Type	Waterbody	Latitude	Longitude
LMM010-0004	Michigan City, IN	Laporte	Lake	Lake Michigan	41.74333	-86.92361
UMC050-0009	East of Columbia Avenue	Lake	River	Grand Calumet River	41.61719	-87.49730
UMC-04-0001	East of Industrial Highway	Lake	River	Grand Calumet River	41.6080	-87.3930
UMC-04-0008	Bridge Street (downstream)	Lake	River	Grand Calumet River	41.6068	-87.3796
UMC-04-0007	East of Buchanan Street	Lake	River	Grand Calumet River	41.6074	-87.3519
WWE060-0028	Cloverdale, IN	Putnam	Reservoir	Cagles Mill Lake	39.48	-86.90389
WWU100-0028	Geist Reservoir, Lawrence, IN	Marion	Reservoir	Geist Reservoir	39.91361	-85.97847
WPA-01-0001	Patoka Reservoir - Jackson State Recreation Area	Orange	Reservoir	Patoka Lake	38.43556	-86.68056
WWU120-0074	Eagle Creek Reservoir	Marion	Reservoir	Eagle Creek Reservoir	39.82611	-86.30444
WWL010-0039	Riddle Point (Southwest End)	Monroe	Reservoir	Lake Lemon	39.26861	-86.41889
WWU080-0033	Noblesville, IN	Hamilton	Reservoir	Morse Reservoir	40.07472	-86.04778
WWL-07-0004	CR 150 North	Daviess	River	Prairie Creek	38.67788	-87.23039
WWU100-0031	S.R. 13, downstream of Dowden Landfill	Madison	River	Fall Creek	39.96583	-85.8425
WWU-07-0001	Strawtown Ave	Hamilton	River	White River	40.13207	-85.9525
WWL-10-0004	Smithville Rd	Knox	River	White River	38.50646	-87.5471
WPA020-0026	S.R. 162. Jasper, IN	Dubois	River	Patoka River	38.3875	-86.92778
WPA080-0037	C.R. 875 West	Gibson	River	Patoka River	38.39533	-87.72872
WWE080-0002	S.R. 59	Clay	River	Eel River	39.33833	-87.10972
WWE090-0008	Upstream of S.R. 67, WORTHINGTON,	Greene	River	Eel River	39.12472	-86.97028
WWE090-0014	CR 400 South and CR 535 West, Old Hill, IN	Clay	River	Eel River	39.30139	-87.20861
WWL030-0014	S.R. 157, Worthington, IN	Greene	River	West Fork White River	39.11194	-86.96278
WWL100-0016	Petersburg, IN	Pike	River	White River	38.51194	-87.28778
WWU010-0029	East of Winchester, IN	Randolph	River	West Fork White River	40.18333	-84.97083

Site ID	Location	County	Waterbody Type	Waterbody	Latitude	Longitude
WWU030-0021	CR 900 West, Daleville, IN	Delaware	River	West Fork White River	40.13111	-85.55694
WWU070-0046	Strawtown Public Access	Hamilton	River	West Fork White River	40.13972	-85.88639
WWU090-0024	Broad Ripple Park, Indianapolis	Marion	River	West Fork White River	39.87222	-86.13278
WWU130-0037	Michigan Street, Indianapolis	Marion	River	West Fork White River	39.77556	-86.18917
WWU140-0002*	Henderson Bridge, CR 390	Morgan	River	West Fork White River	39.49917	-86.35528
WWE-06-0002	Towpath Road	Clay	Stream	Birch Creek	39.32655	-87.17936
WWE-03-0002	CR 1100 South	Putnam	Stream	Deer Creek	39.5048	-86.92277
WWE-02-0004	CR 525 Southwest	Putnam	Stream	Little Walnut Creek	39.62445	-86.94165
WWL-06-0051	Riverdale Road	Knox	Stream	Black Creek	38.83334	-87.215
WWU-05-0002	S.R. 213	Hamilton	Stream	Duck Creek	40.13822	-85.93949
WWE050-0007	S.R. 243, Putnamville, IN	Putnam	Stream	Deer Creek	39.56806	-86.86778
WWL040-0028	S.R. 54	Greene	Stream	Richland Creek	39.02754	-86.90701
WWL040-0051	S.R. 43, Whitehall Cemetary	Monroe	Stream	Richland Creek	39.17	-86.68278
WWU070-0022	S.R. 38	Hamilton	Stream	Stony Creek	40.03972	-85.95056
WWU070-0035	S.R. 37A, Noblesville, IN	Hamilton	Stream	Stony Creek	40.02292	-86.01181
WWU110-0009	Keystone Avenue, Indianapolis	Marion	Stream	Fall Creek	39.83528	-86.11972
WWU120-0073	Kentucky Avenue, Indianapolis	Marion	Stream	Eagle Creek	39.73667	-86.19667
WWU150-0027	Brooklyn, IN	Morgan	Stream	White Lick Creek	39.53833	-86.36667
WWU-02-0002	Walnut Street, Muncie, IN	Delaware	Stream	Buck Creek	40.156853	-85.383801
WWU-02-0003	23 rd Street, Muncie, IN	Delaware	Stream	Buck Creek	40.167437	-85.391691
WWU-02-0004	W 200 S, Muncie, IN	Delaware	Stream	Buck Creek	40.163867	-85.436796
WWU-02-0005	Hoyt Avenue, Muncie, IN	Delaware	Stream	Buck Creek	40.171305	-85.406736

^{*=}Historical U.S. EPA CORE Site

5. Develop a Decision Rule

The ALUS decisions will include independent evaluations of biological and chemical data as outlined in Indiana's 2014 Consolidated Assessment and Listing Methodology (CALM, IDEM 2014). Fish Consumption Advisory and 303(d) fish consumption use attainment decisions will be based on edible portion tissue concentrations of total PCB and/or total mercury, determined using the analytical methods shown in Tables 4-18 of this workplan. Determination of fish consumption advisory classifications is based on the "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory for PCBs" (Anderson et al. 1993) and for mercury (McCann and Anderson, 2007), and is the responsibility of the ISDH. The ALUS decisions include independent evaluations of edible portion fish tissue wet weight concentrations of total PCB and/or mercury. A site will be considered "not supporting" for the aquatic life use of fish consumption when any one sample exceeds the criteria set forth for the List of Impaired Waters under Section 303(d) of the CWA. Specifically, a site will be considered not supporting for the aquatic life use of fish consumption when total PCBs exceed 20 µg/kg wet weight or total mercury exceeds 300 µg/kg wet weight in the edible portion of any composite or individual fish sample from that site (Table 1).

6. Specify Tolerable Limits on Decision Errors

Site-specific aquatic life use assessments for fish consumption include program-specific controls to identify analysis errors. These controls include laboratory blanks and duplicates, matrix spikes, laboratory control spikes, ongoing laboratory performance evaluations, and analytical chemistry data qualifiers and flags as specified in the project RFP 12-68 (IDEM 2012c), the analytical services contract (IDOA, 2013), the Quality Control Requirements section of the Watershed Assessment and Planning Branch's Quality Assurance Project Plan (QAPP) (IDEM 2004, pages 119-120), and the OWQ Quality Management Plan (IDEM 2012b, page 38). Analytical chemistry data qualifiers and flags are outlined in Table D3 of the WAPB QAPP (IDEM 2004, page 130) and in Section IV of this Work Plan.

Any data flagged as "estimated" may be used on a case-by-case basis. Fish tissue samples flagged as not meeting minimum quality control requirements will be re-analyzed using the preserved sample material stored at the contract laboratory. All samples will be preserved, as agreed in the analytical services contract, by the laboratory until sample data are approved by IDEM chemists. Once all analytical data has been approved by the chemists, any data from samples exceeding benchmarks for ALUS impairment for fish consumption and for FCAs (Table 1) will be identified and presented to the Integrated Report Coordinator for determination of 303(d) Listing of Impaired Waters, and to the Indiana Interagency Fish Consumption Advisory Workgroup for FCA considerations, respectively. Any data which is "rejected" due to analytical problems or errors will not be used for water quality assessment decisions or in FCA determinations. Further investigation will be conducted in response to consistent "rejected" data to determine the source of error. Field techniques used during sample collection and preparation, along with laboratory procedures will be subject to periodic evaluation by both WAPB QA and field staff.

7. Optimize the Design for Obtaining Data

The fish tissue contaminants monitoring program follows the original five-year basin rotation design of the WAPB Water Monitoring Program. The rotating basin approach facilitates a more comprehensive estimation of the extent of impairment within the basin. In addition, samples are accepted from IDNR DFW that were collected during their study projects. This agency partnership increases sampling efficiency, while also reducing the stress put on biological communities caused by multiple sampling events on the same waterbody. These could include samples from natural lakes, streams, or Indiana waters of Lake Michigan. These locations may not necessarily be in the target basin of the OWQ Monitoring Strategy. IDNR has trained staff handling and processing the fish following the U.S EPA guidance (U.S. EPA 2000c) and the procedures described in this workplan. Sampling may also occur in watersheds outside the targeted basins to support IDEM objectives, or other agency programs. Other targeted locations for special studies may also be identified. The number of sites is determined by the annual fish tissue budget for laboratory analysis. Site selection then follows a tiered strategy. First, sampling at the U.S. EPA historical "core" sites in the basins is prioritized to continue to develop long term trends. Next, profiles of large river systems within the basins are targeted, as well as sites with known historical contamination (e.g., superfund sites). The remaining sites are

selected along major tributaries, public lands (e.g., IDNR property, city parks), unassessed stream reaches, and places of interest as specified by other programs (e.g., permitting, risk assessment, state cleanup). Sites are selected at public access sites when applicable to promote data collection at places with known recreational activity.

Table 3: Training and Staffing Requirements

Role	Required	Responsibilities	Training References
Project Manager	-Bachelor of Science Degree in biology, toxicology, or other closely related field plus four years of experience in aquatic ecosystems (Masters Degree with two years aquatic ecosystems experience may substitute) -Database experience -Annually review the Principles and Techniques of Electrofishing -Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Establish Project in the AIMS II database -Oversee development of Project Work Plan -Oversee entry and QC of field data -Oversee querying of data from AIMS II database to determine results not meeting aquatic life use Water Quality Criteria -Sample shipments to contract laboratory -Assign analysis tasks to the samples -Track contract laboratory expenditures	-AIMS II Database User Guide -U.S. EPA 2006 QA Documents on developing Work Plans (QAPPs)
Field Crew Chief	-Bachelor of Science Degree in biology or other closely related field -At least one year of experience in sampling methodology and taxonomy of aquatic communities in the region -Annually review the Principles and Techniques of Electrofishing -Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Completion of field data sheets -Taxonomic accuracy -Overall operation of field crew when remote from central office -Adherence to safety and field SOP by crew members -Ensure field sampling equipment is functioning properly and all equipment loaded into vehicles prior to field sampling activities -Maintaining proper preservation of samples -Hold an active First Aid and CPR certification	-IDEM 1992a, 1992b, 1992c, 1992d, 2002, 2008, 2010b, 2010c -U.S. EPA, 1994a -Novotny, 1974 -Cowx, 1990 Cowx and Lamarque, 1990
Field Crew Members	-Complete hands-on training for sampling methodology prior to field sampling activities	-Follow all safety and SOP procedures while engaged in field sampling activities	-IDEM 1992a, 1992b, 1992c, 1992d, 2002, 2008, 2010b, 2010c -U.S. EPA, 1994a

Training and Staffing Requirements, Continued

Field Crew Members (continued)	-Review the Principles and Techniques of Electrofishing -Review relevant safety procedures -Review relevant SOP documents for field and sample processing operations	-Follow direction of Field Crew Chief while conducting field sampling activities -Hold an active First Aid and CPR certification	-Novotny, 1974 -Cowx, 1990 -Cowx and Lamarque, 1990
Quality Assurance Officer	-Bachelor of Science in chemistry or a related field of study -Familiarity with QA/QC practices and methodologies -Familiarity with the WAPB QAPP and data qualification methodologies	-Ensure adherence to QA/QC requirements of WAPB QAPP -Evaluate data collected by sampling crews for adherence to project Work Plan -Review data collected by field sampling crews for completeness and accuracy -Perform a data quality analysis of data generated by the project -Assign data quality levels based on the data quality analysis -Import data into the AIMS II database -Ensure that field sampling methodology audits are completed according to WAPB procedures	-IDEM 2004, 2012b -U.S. EPA 2006 documentation on QAPP Development and data qualification -AIMS II Database User Guide

II. MEASUREMENT/DATA ACQUISITION

Sampling Design and Site Locations

The fish tissue contaminants monitoring program currently prioritizes targeted lake and river sites based on the following criteria:

- Historical U.S. EPA monitoring program stations ("core" sites),
- Current status of fish consumption advisories or known contaminated stream reaches,
- New locations of interest that have never been sampled,
- Public access reservoir and natural lakes,
- Locations where there is adequate historical data which can be used to assess trends,
- Unassessed stream reaches based on 10-digit HUC pour points,
- Sampling requests by other programs within and external to the IDEM,
- Special studies.

Generally this program targets approximately 3-5 fish tissue samples from 35-45 sites per year. The number of sites and the samples collected from each site are highly variable and based on available WAPB resources and funds allocated in the laboratory service contract. Table 2 lists the tentative fish tissue sampling sites for the tributaries to the West Fork White River Basin, Patoka Basin, and the Lake Michigan Basin. Forty-five sites are targeted for sampling in the 2016 fish tissue contaminants monitoring program. Fish tissue collections can occur year round, although the most desireable sampling period is from late summer to early fall (i.e. August through October). The lipid content of many species (which is a reservoir for organic pollutants) is generally highest at this time. Also, water levels are typically lower during this time, thus simplifying collection procedures (U.S. EPA 2000c).

Sampling Methods

Fish Collection and Tissue Sample Preparation General Procedures.

The following is a general summary of procedures for collection, preparation, and preservation of all fish tissue samples collected for contaminant analysis. An SOP for fish collection and tissue preparation is currently under development.

- Step 1. Sample the fish community following sampling equipment standard operating procedures (USFWS 1998, IDEM 1992a). In some cases, lakes will be sampled using gill nets (IDEM 1992a).
- Examine fish collected and select the predetermined number of samples for the site Step 2. (generally between 3-5 samples). A sample may be comprised of 1-12 fish (depending on size) of the same species. The preferred total lengths of the smallest and largest individuals of any composite sample should be within 90% of each other. Total lengths as low as 75% will be tolerated in order to obtain an adequate composite sample. Preferable samples collected from a site consist of those species collected historically from the site, different size classes of predator species, or Common Carp. In addition, if there are consumption advisories listed on the Indiana Fish Consumption Advisory, those species and size classes should be targeted to support updates to the advisory information. If a site has no historical samples, representative samples of a bottom feeder such as Common Carp, a predator game fish species such as Largemouth Bass, Channel Catfish or Flathead Catfish, and a panfish commonly consumed by humans, such as sunfish species, crappie species, Rock Bass or others should be targeted. If the site has been targeted based on potential or known contamination, in addition to the guidance above, fish species with small home ranges should be targeted to ensure the data results are indicative of the in-stream conditions at the site. All other fish captured during the sampling effort should be released back into the water.
- Step 3. Fish selected as samples should be placed in a cooler and covered with ice to euthanize and to prevent any decomposition from occurring prior to sample processing. Using a piece of label tape, tag the outside of the cooler with site information, including the sample number (AB Number), site location, date, waterbody, and county information.
- Step 4. Are samples processed in the field?
 - If yes, proceed to Step 6.
 - If no, proceed to Step 5.
- Step 5. Return to the laboratory.
- Step 6. In the laboratory, place fish from one site into the laboratory sink, and sort out fish into composite samples by matching total lengths for each species. If samples are processed in the field, fish species should be sorted in the cooler by length, as described above.

- Step 7. Complete the Site ID, Event ID, Date and Time, and site location information on the Fish Tissue Contaminant Monitoring Program Field Data Form (Appendix 1).
- Step 8. On the Fish Tissue Contaminant Monitoring Program Field Data Form (Appendix 1), fill out the composite sample number (AB Number-Taxon ID-species sample number), the number of fish in the composite sample, the species name and the preparation method (whole fish, skin-on scaleless fillets, skin-on scales-on fillets, skin-off fillets, beheaded and gutted, etc.). Below is an example of a fish sample composite number (AB#####-###):
 - AB24997-043-01
- Step 9. Measure and record the total length in millimeters (to the nearest millimeter) and weight in grams (to the nearest gram) of each fish within a composite sample. Also note any individual fish anomalies, such as deformities, eroded fins, lesions, tumors.
- Step 10. Are there more composite samples?

Yes, repeat Step 8.

No, proceed to Step 11.

- Step 11. Prepare filleting stations by setting out dedicated food grade plastic low density polyethylene cutting boards or covering work station with clean aluminum foil. Set out the fish scale removers, scalpel, fish skinning pliers, and stainless steel fillet knives to be used during filleting. Sharpen knives as necessary to reduce ragged cuts and slippage, which often occurs when the use of pressure increases cutting with dull knives. Staff should wear new nitrile or latex gloves for each site in order to minimize the potential of contaminants transferring from hands to tissue samples.
- Step 12. Fish fillet samples will be prepared as **skin-on scaleless** fillets for scaled species and **skin-off** fillets for scaleless species (Anderson *et al.* 1993; IDEM 1992b). Remove scales from both sides of the fish, back and belly areas (if necessary). Fillet the fish so as to include all flesh from the back of the head to the tail and from the top of the back down to and including the belly flap area of the fish. Fins, tail, head, viscera, and major bones are to be removed. If the fish sample is to be analyzed whole, the composite sample consisting of these fish does not have to be filleted. Place each fillet from the composite sample into the same stainless steel bucket containing tap water, or ambient water if processing in the field. The water in the bucket is used to rinse off any soil, scales, or mucous adhering to the sample.
- Step 13. Drain off excess water and **double wrap** the fillets in clean aluminum foil to make a package. For whole fish, all individual fish of a composite sample should be double wrapped together if possible. Using a blunt tip black permanent marker, label the outside of the package with the following information:
 - Sample number (e.g., AB49005-121-01)
 - Number of individuals in the sample
 - Species of fish (common name)
 - Preparation (e.g., scaleless, skin-on fillets; scaleless, skin-off fillets; scaleless, whole fish)
 - Waterbody name
 - County
 - Location description
 - Date of collection (format: 01-March-2015)
 - Package count if more than one package per sample (e.g., 1 of 2, 2 of 2)

Example:

AB13201-043-01

3-Common Carp, skin-on fillets, Scaleless

West Fork White River Marion Co. Broad Ripple Park 8/21/2015

- Step 14. Each foil package will be placed individually into an appropriate size zip-lock type bag or other food grade plastic bag and sealed. Using a blunt tip black permanent marker, label the outside of the package with the following information:
 - Sample number (e.g., AB49005-121-01)
 - Package count if more than one package per sample (e.g., 1 of 2, 2 of 2)
- Step 15. Tissue samples need to be frozen as soon as possible. Is the processing taking place in the field?

If yes, it may be necessary for field staff to bring dry ice along for overnight field trips. Use a dry ice chest for dry ice storage (The Fish Tissue program has four). Dry ice will be provided by the contracted analytical services laboratory for the project. (However, this needs to be anticipated so that the Contract Laboratory can make arrangements for dry ice to be delivered to the Western Select Properties office location before staff depart for the field.) Place the double wrapped and bagged samples in the dry ice chest underneath the dry ice for preservation of tissue material. Upon return to the office place all processed tissue samples in the chest style analytical grade freezer located in the IDEM Watershed Assessment and Planning Branch laboratory or the upright commercial grade freezer located in building 41.

If no, place double wrapped and bagged samples in the chest style analytical grade freezer located in the IDEM Watershed Assessment and Planning Branch laboratory or the upright commercial grade freezer located in building 41.

Step 16. Are there more composite samples to be processed?

If yes, proceed to Step 6.

If no, proceed to Step 16.

- Step 17. Wash all stainless steel buckets, stainless steel filleting knives, scalers, sharpening steels, mass scales, measuring boards, cutting boards, coolers, with ALCONOX® detergent (laboratory quality environmental cleaning product) and a scrub brush. Wipe down countertops with ALCONOX® soaked rag and throw away used nitrile or latex gloves.
- Step 18. Are there more sites to be processed?

If yes, proceed to Step 6.

If no, proceed to Step 19.

- Step 19. Put all cleaned processing equipment on the drying racks or in the storage bins with lids. Clean out the sink, mop the floor, and take trash bags full of fish carcasses to the dumpster. Leave the laboratory in the condition found so as not to disrupt the function of other staff programs. If processing samples in the field, sample processing equipment will be put into the storage bins and then replaced back into the truck. Leave the processing area (usually near the boat ramp or nearshore in the condition found as much as possible, picking up as many fish scales as possible and leaving no fish waste, such as entrails or filleted fish carcasses, or trash behind.
- Step 20. Field sampling crew leader will complete any missing information on the Fish Tissue Contaminants Monitoring Program Field Data Form (Appendix 1) and calculate the composite length and weight and the percent ranges for length and weight on all field data

forms. Also, the crew leader should log in all samples processed into the Nalgene® field sample log book.

Step 21. The Fish Tissue Contaminants Monitoring Program Field Data Form (Appendix 1) is ready for entry into the AIMS II database.

Field Staff Precautions for Preventing Contamination of Tissue Samples:

- □ Keep all fish tissue sample preparation supplies away from generators, gasoline or oil containers, etc.
- Dry ice chest containing tissue samples should be positioned in the truck away from generator, gasoline cans, oil, etc.
- Staff are prohibited from applying mosquito repellent containing DEET or other bioaccumulating chemicals during fish tissue sampling and processing procedures.

Analytical Methods

For purposes of this project analytes are arranged into analytical task groups. Tables 4 through 18 list parameters (metals, organochlorine chemical, PCBs, etc.) with their respective test methods and contract required quantitation limits (CRQL) (Pace Analytical, Inc.). Analyses are requested by these tasks. Analytical methods applicable to this project are listed under contract ARN A305-3-7 (IDOA 2013) and accompanying request for proposal (RFP) 12-68 (IDEM 2012c). In compliance with contract bid requirements, Pace Analytical has submitted a copy of their QA Manual and applicable SOPs to WAPB.

Quality Control and Custody Requirements

Every effort will be made to follow quality assurance protocols as set forth in the "QAPP for the Indiana Surface Water Quality Monitoring and TMDL Program," 2004, Revision 3 (IDEM 2004). Quality control requirements specific to this project are also listed within contract ARN A305-3-7 (IDOA 2013) and accompanying RFP 12-68 (IDEM 2012c).

Fish Tissue Field Data Documentation

Fish common name, total length (in millimeters), and mass (in grams) measurements are made on each fish to be included in their respective composite samples. Information on the fishing method and any identified DELTS (deformities, eroded fins, lesions, tumors) will be recorded on the fish tissue sample field data form (Appendix 1). Site maps are marked to show the general or specific areas from which fish were collected. There are no field duplicates collected or field blanks carried during the sampling and sample preparation process for fish tissue.

Analytical Data Reports

A report for each batch of samples (or sample set) consisting of chain-of-custody form (Appendix B), spreadsheets of results, and the quality control report, will be submitted in electronic (pdf) format in accordance with the contract requirements. In addition, an electronic data interchange (EDI) file containing lab data and lab QC will be submitted for each sample set. The EDI file will be in compliance with IDEM/OWQ WAPB's EDI format specification. EDI files will be uploaded into the AIMS database. Reports shall meet requirements of DQA Level 4 (see WAPB QAPP) (IDEM 2004, pp 128-129) and be submitted to the Technical and Logistical Services Section for review.

Field Parameter Measurements/Instrument Testing/Calibration

The mechanical and digital scales used in weighing individual fish are tared between measurements. The scales are also calibrated every five years by the Indiana State Weights and Measures Office by a certified weighmaster to ensure accuracy of the devices.

Table 4: Fish Tissue General Parameters.

TASK 1 PERCENT LIPID and PERCENT MOISTURE

"Pace Lipid" Method (On file with WAPB)
ASTM D2974-87 (ASTM 1987)

	BIOTA	
PARAMETER	CRQL	UNITS
PERCENT LIPID	0.1	%
PERCENT MOISTURE		0.1

^{%=}percentage units

Table 5: Fish Tissue Chemistry Total PCBs.

TASK 3 POLYCHLORINATED BIPHENYLS (PCB) TARGET PARAMETER LIST (TPL)

Preparation Method 3540C (U.S. EPA 1996a) Method 8082 (U.S. EPA 1996c)

		BIOLOGICAL		BIOLOGICAL			NT
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**		
Total PCBs	1336-36-3	20.0	μg/kg	NA	NA		

μg/kg (ww)=micrograms per kilogram wet weight basis

Table 6: Fish Tissue Chemistry PCB Congener Compounds.

TASK 3B

POLYCHLORINATED BIPHENYL CONGENERS S (PCB)
TISSUES BY CAPILLARY CHROMATOGRAPHY
TARGET PARAMETER LIST (TPL)

Method 1668 Rev. A (U.S. EPA 2000b)

		BIOLOGICAL		SEDIME	NT
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
PCB congeners	See Table Below	0.5 - 20	ng/kg	0.5 - 20	ng/kg

* wet weight basis

ng/kg nanograms per kilogram

** dry weight basis

Table of PCB Congeners and Other Species Current BZ¹ & CASRN **IUPAC Name Descriptor** Type **IUPAC** Number CP1 --- --2051-60-7 2-Chlorobiphenyl 1 Congener CP0_---_-2 2051-61-8 3-Chlorobiphenyl Congener CP0_---_-2051-62-9 3 4-Chlorobiphenyl Congener 13029-08-8 4 2,2'-Dichlorobiphenyl --- --- -- --Congener CP1 --- --16605-91-7 5 2,3-Dichlorobiphenyl Congener CP1 --- --25569-80-6 6 2,3'-Dichlorobiphenyl Congener CP1 --- --33284-50-3 2,4-Dichlorobiphenyl 7 Congener CP1_---8 34883-43-7 2,4'-Dichlorobiphenyl Congener CP1 --- --34883-39-1 9 2,5-Dichlorobiphenyl Congener ---_---33146-45-1 10 2,6-Dichlorobiphenyl Congener CP0_---_2M 11 2050-67-1 3,3'-Dichlorobiphenyl Congener CP0_---_-2974-92-7 12 3,4-Dichlorobiphenyl Congener CP0_---_-2974-90-5 13 3,4'-Dichlorobiphenyl Congener CP0_---_2M 14 34883-41-5 3,5-Dichlorobiphenyl Congener CP0 --- PP --15 2050-68-2 4,4'-Dichlorobiphenyl Congener ---_---38444-78-9 16 2,2',3-Trichlorobiphenyl Congener 37680-66-3 17 2,2',4-Trichlorobiphenyl Congener 37680-65-2 18 2,2',5-Trichlorobiphenyl Congener --- --- -- --38444-73-4 19 2,2',6-Trichlorobiphenyl Congener -_---_--CP1_---_2M 20 38444-84-7 2,3,3'-Trichlorobiphenyl Congener

¹ BZ was named after Ballschmiter, K.; Zell, M. (1980). "Analysis of polychlorinated biphenyls (PCB) by glass capillary gas chromatography". *Fresenius' Zeitschrift für Analytische Chemie* **302**: 20–31.

sk 3B continue	d		
CASRN	Current BZ & IUPAC Number	IUPAC Name	Туре
55702-46-0	21	2,3,4-Trichlorobiphenyl	Congener
38444-85-8	22	2,3,4'-Trichlorobiphenyl	Congener
55720-44-0	23	2,3,5-Trichlorobiphenyl	Congener
55702-45-9	24	2,3,6-Trichlorobiphenyl	Congener
55712-37-3	25	2,3',4-Trichlorobiphenyl	Congener
38444-81-4	26	2,3',5-Trichlorobiphenyl	Congener
38444-76-7	27	2,3',6-Trichlorobiphenyl	Congener
7012-37-5	28	2,4,4'-Trichlorobiphenyl	Congener
15862-07-4	29	2,4,5-Trichlorobiphenyl	Congener
35693-92-6	30	2,4,6-Trichlorobiphenyl	Congener
16606-02-3	31	2,4',5-Trichlorobiphenyl	Congener
38444-77-8	32	2,4',6-Trichlorobiphenyl	Congener
38444-86-9	33	2,3',4'-Trichlorobiphenyl	Congener
37680-68-5	34	2,3',5'-Trichlorobiphenyl	Congener
37680-69-6	35	1	Congener
38444-87-0	36	3,3',5-Trichlorobiphenyl	Congener
38444-90-5	37	3,4,4'-Trichlorobiphenyl	Congener
53555-66-1	38		Congener
38444-88-1	39		Congener
	40		Congener
	41		Congener
	42		Congener
	43		Congener
	44	·	Congener
			Congener
		·	Congener
			Congener
		• •	Congener
			Congener
	55702-46-0 38444-85-8 55720-44-0 55702-45-9 55712-37-3 38444-81-4 38444-76-7 7012-37-5 15862-07-4 35693-92-6 16606-02-3 38444-77-8 38444-86-9 37680-68-5 37680-69-6 38444-87-0 38444-90-5 53555-66-1	CASRN BZ & IUPAC Number 55702-46-0 21 38444-85-8 22 55720-44-0 23 55702-45-9 24 55712-37-3 25 38444-81-4 26 38444-76-7 27 7012-37-5 28 15862-07-4 29 35693-92-6 30 16606-02-3 31 38444-77-8 32 38444-86-9 33 37680-68-5 34 37680-69-6 35 38444-87-0 36 38444-90-5 37 53555-66-1 38 38444-93-8 40 52663-59-9 41 36559-22-5 42 70362-46-8 43 41464-39-5 44 70362-46-8 43 41464-47-5 46 2437-79-8 47 70362-47-9 48 41464-40-8 49 62796-65-0 50 68194	CASRN

Table B2.1.1.3c Task 3B continued						
Descriptor	CASRN	Current BZ & IUPAC Number	IUPAC Name	Туре		
CP1_4CL2M	33284-53-6	61	2,3,4,5-Tetrachlorobiphenyl	Congener		
4CL	54230-22-7	62	2,3,4,6-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	74472-34-7	63	2,3,4',5-Tetrachlorobiphenyl	Congener		
4CL	52663-58-8	64	2,3,4',6-Tetrachlorobiphenyl	Congener		
4CL2M	33284-54-7	65	2,3,5,6-Tetrachlorobiphenyl	Congener		
CP1_4CL_PP	32598-10-0	66	2,3',4,4'-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	73575-53-8	67	2,3',4,5-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	73575-52-7	68	2,3',4,5'-Tetrachlorobiphenyl	Congener		
4CL	60233-24-1	69	2,3',4,6-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	32598-11-1	70	2,3',4',5-Tetrachlorobiphenyl	Congener		
4CL	41464-46-4	71	2,3,4,6-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	41464-42-0	72	2,3,5,5-Tetrachlorobiphenyl	Congener		
4CL2M	74338-23-1	73	2,3,5,6-Tetrachlorobiphenyl	Congener		
CP1_4CL_PP	32690-93-0	74	2,4,4,5-Tetrachlorobiphenyl	Congener		
4CL_PP	32598-12-2	75	2,4,4,6-Tetrachlorobiphenyl	Congener		
CP1_4CL2M	70362-48-0	76	2,3,4,5-Tetrachlorobiphenyl	Congener		
CP0_4CL_PP_2M	32598-13-3	77	3,3,4,4-Tetrachlorobiphenyl	Congener		
CP0_4CL2M	70362-49-1	78	3,3,4,5-Tetrachlorobiphenyl	Congener		
CP0_4CL2M	41464-48-6	79	3,3,4,5-Tetrachlorobiphenyl	Congener		
CP0_4CL2M	33284-52-5	80	3,3,5,5-Tetrachlorobiphenyl	Congener		
CP0_4CL_PP_2M	70362-50-4	81	3,4,4,5-Tetrachlorobiphenyl	Congener		
4CL2M	52663-62-4	82	2,2,3,3,4-Pentachlorobiphenyl	Congener		
4CL2M	60145-20-2	83	2,2,3,3,5-Pentachlorobiphenyl	Congener		
4CL2M	52663-60-2	84	2,2,3,3,6-Pentachlorobiphenyl	Congener		
4CL_PP	65510-45-4	85	2,2,3,4,4-Pentachlorobiphenyl	Congener		
4CL2M	55312-69-1	86	2,2,3,4,5-Pentachlorobiphenyl	Congener		
4CL2M	38380-02-8	87	2,2,3,4,5-Pentachlorobiphenyl	Congener		
4CL	55215-17-3	88	2,2,3,4,6-Pentachlorobiphenyl	Congener		
4CL	73575-57-2	89	2,2,3,4,6-Pentachlorobiphenyl	Congener		
4CL2M	68194-07-0	90	2,2,3,4,5-Pentachlorobiphenyl	Congener		
4CL	68194-05-8	91	2,2',3,4',6-Pentachlorobiphenyl	Congener		
 4CL2M	52663-61-3	92	2,2',3,5,5'-Pentachlorobiphenyl	Congener		
4CL2M	73575-56-1	93	2,2',3,5,6-Pentachlorobiphenyl	Congener		
4CL2M	73575-55-0	94	2,2',3,5,6'-Pentachlorobiphenyl	Congener		
4CL2M	38379-99-6	95	2,2',3,5',6-Pentachlorobiphenyl	Congener		
4CL	73575-54-9	96	2,2',3,6,6'-Pentachlorobiphenyl	Congener		
4CL2M	41464-51-1	97	2,2',3,4',5'-Pentachlorobiphenyl	Congener		
4CL	60233-25-2	98	2,2',3,4',6'-Pentachlorobiphenyl	Congener		
4CL_PP	38380-01-7	99	2,2',4,4',5-Pentachlorobiphenyl	Congener		
4CL_PP	39485-83-1	100	2,2',4,4',6-Pentachlorobiphenyl	Congener		
4CL2M	37680-73-2	101	2,2',4,5,5'-Pentachlorobiphenyl	Congener		

Table B2.1.1.3c Task 3B continued Current						
Descriptor	CASRN	BZ & IUPAC Number	IUPAC Name	Туре		
4CL	68194-06-9	102	2,2',4,5,6'-Pentachlorobiphenyl	Congener		
4CL	60145-21-3	103	2,2',4,5',6-Pentachlorobiphenyl	Congener		
4CL	56558-16-8	104	2,2',4,6,6'-Pentachlorobiphenyl	Congener		
CP1_4CL_PP_2M	32598-14-4	105	2,3,3',4,4'-Pentachlorobiphenyl	Congener		
CP1_4CL2M	70424-69-0	106	2,3,3',4,5-Pentachlorobiphenyl	Congener		
CP1_4CL2M	70424-68-9	107	2,3,3',4',5-Pentachlorobiphenyl	Congener		
CP1_4CL2M	70362-41-3	108	2,3,3',4,5'-Pentachlorobiphenyl	Congener		
4CL2M	74472-35-8	109	2,3,3',4,6-Pentachlorobiphenyl	Congener		
4CL2M	38380-03-9	110	2,3,3',4',6-Pentachlorobiphenyl	Congener		
CP1_4CL2M	39635-32-0	111	2,3,3',5,5'-Pentachlorobiphenyl	Congener		
4CL2M	74472-36-9	112	2,3,3',5,6-Pentachlorobiphenyl	Congener		
4CL2M	68194-10-5	113	2,3,3',5',6-Pentachlorobiphenyl	Congener		
CP1_4CL_PP_2M	74472-37-0	114	2,3,4,4',5-Pentachlorobiphenyl	Congener		
4CL_PP	74472-38-1	115	2,3,4,4',6-Pentachlorobiphenyl	Congener		
4CL2M	18259-05-7	116	2,3,4,5,6-Pentachlorobiphenyl	Congener		
4CL2M	68194-11-6	117	2,3,4',5,6-Pentachlorobiphenyl	Congener		
CP1_4CL_PP_2M	31508-00-6	118	2,3',4,4',5-Pentachlorobiphenyl	Congener		
4CL_PP	56558-17-9	119	2,3',4,4',6-Pentachlorobiphenyl	Congener		
CP1_4CL2M	68194-12-7	120	2,3',4,5,5'-Pentachlorobiphenyl	Congener		
4CL2M	56558-18-0	121	2,3',4,5',6-Pentachlorobiphenyl	Congener		
CP1_4CL2M	76842-07-4	122	2,3,3',4',5'-Pentachlorobiphenyl	Congener		
CP1_4CL_PP_2M	65510-44-3	123	2,3',4,4',5'-Pentachlorobiphenyl	Congener		
CP1_4CL2M	70424-70-3	124	2,3',4',5,5'-Pentachlorobiphenyl	Congener		
4CL2M	74472-39-2	125	2,3',4',5',6-Pentachlorobiphenyl	Congener		
CP0_4CL_PP_2M	57465-28-8	126	3,3',4,4',5-Pentachlorobiphenyl	Congener		
CP0_4CL2M	39635-33-1	127	3,3',4,5,5'-Pentachlorobiphenyl	Congener		
4CL_PP_2M	38380-07-3	128	2,2',3,3',4,4'-Hexachlorobiphenyl	Congener		
4CL2M	55215-18-4	129	2,2',3,3',4,5-Hexachlorobiphenyl	Congener		
4CL2M	52663-66-8	130	2,2',3,3',4,5'-Hexachlorobiphenyl	Congener		
4CL2M	61798-70-7	131	2,2',3,3',4,6-Hexachlorobiphenyl	Congener		
4CL2M	38380-05-1	132	2,2',3,3',4,6'-Hexachlorobiphenyl	Congener		
4CL2M	35694-04-3	133	2,2',3,3',5,5'-Hexachlorobiphenyl	Congener		
4CL2M	52704-70-8	134	2,2',3,3',5,6-Hexachlorobiphenyl	Congener		
4CL2M	52744-13-5	135	2,2',3,3',5,6'-Hexachlorobiphenyl	Congener		
4CL2M	38411-22-2	136	2,2',3,3',6,6'-Hexachlorobiphenyl	Congener		
4CL_PP_2M	35694-06-5	137	2,2',3,4,4',5-Hexachlorobiphenyl	Congener		
4CL PP 2M	35065-28-2	138	2,2',3,4,4',5'-Hexachlorobiphenyl	Congener		
4CL_PP	56030-56-9	139	2,2',3,4,4',6-Hexachlorobiphenyl	Congener		
4CL PP	59291-64-4	140	2,2',3,4,4',6'-Hexachlorobiphenyl	Congener		
4CL2M	52712-04-6	141	2,2',3,4,5,5'-Hexachlorobiphenyl	Congener		
4CL2M	41411-61-4	142	2,2',3,4,5,6-Hexachlorobiphenyl	Congener		

Descriptor	CASRN	Current BZ & IUPAC Number	IUPAC Name	Туре
4CL2M	68194-15-0	143	2,2',3,4,5,6'-Hexachlorobiphenyl	Congener
4CL2M	68194-14-9	144	2,2',3,4,5',6-Hexachlorobiphenyl	Congener
4CL	74472-40-5	145	2,2',3,4,6,6'-Hexachlorobiphenyl	Congener
4CL2M	51908-16-8	146	2,2',3,4',5,5'-Hexachlorobiphenyl	Congener
4CL2M	68194-13-8	147	2,2',3,4',5,6-Hexachlorobiphenyl	Congener
4CL2M	74472-41-6	148	2,2',3,4',5,6'-Hexachlorobiphenyl	Congener
4CL2M	38380-04-0	149	2,2',3,4',5',6-Hexachlorobiphenyl	Congener
4CL	68194-08-1	150	2,2',3,4',6,6'-Hexachlorobiphenyl	Congener
4CL2M	52663-63-5	151	2,2',3,5,5',6-Hexachlorobiphenyl	Congener
4CL2M	68194-09-2	152	2,2',3,5,6,6'-Hexachlorobiphenyl	Congener
4CL_PP_2M	35065-27-1	153	2,2',4,4',5,5'-Hexachlorobiphenyl	Congener
4CL_PP	60145-22-4	154	2,2',4,4',5,6'-Hexachlorobiphenyl	Congener
4CL_PP	33979-03-2	155	2,2',4,4',6,6'-Hexachlorobiphenyl	Congener
CP1_4CL_PP_2M	38380-08-4	156	2,3,3',4,4',5-Hexachlorobiphenyl	Congener
CP1_4CL_PP_2M	69782-90-7	157	2,3,3',4,4',5'-Hexachlorobiphenyl	Congener
4CL_PP_2M	74472-42-7	158	2,3,3',4,4',6-Hexachlorobiphenyl	Congener
CP1_4CL2M	39635-35-3	159	2,3,3',4,5,5'-Hexachlorobiphenyl	Congener
4CL2M	41411-62-5	160	2,3,3',4,5,6-Hexachlorobiphenyl	Congener
4CL2M	74472-43-8	161	2,3,3',4,5',6-Hexachlorobiphenyl	Congener
CP1_4CL2M	39635-34-2	162	2,3,3',4',5,5'-Hexachlorobiphenyl	Congener
4CL2M	74472-44-9	163	2,3,3',4',5,6-Hexachlorobiphenyl	Congener
4CL2M	74472-45-0	164	2,3,3',4',5',6-Hexachlorobiphenyl	Congener
4CL2M	74472-46-1	165	2,3,3',5,5',6-Hexachlorobiphenyl	Congener
4CL_PP_2M	41411-63-6	166	2,3,4,4',5,6-Hexachlorobiphenyl	Congener
CP1_4CL_PP_2M	52663-72-6	167	2,3',4,4',5,5'-Hexachlorobiphenyl	Congener
4CL_PP_2M	59291-65-5	168	2,3',4,4',5',6-Hexachlorobiphenyl	Congener
CP0_4CL_PP_2M	32774-16-6	169	3,3',4,4',5,5'-Hexachlorobiphenyl	Congener
4CL_PP_2M	35065-30-6	170	2,2',3,3',4,4',5-Heptachlorobiphenyl	Congener
4CL_PP_2M	52663-71-5	171	2,2',3,3',4,4',6-Heptachlorobiphenyl	Congener
4CL2M	52663-74-8	172	2,2',3,3',4,5,5'-Heptachlorobiphenyl	Congener
4CL2M	68194-16-1	173	2,2',3,3',4,5,6-Heptachlorobiphenyl	Congener
4CL2M	38411-25-5	174	2,2',3,3',4,5,6'-Heptachlorobiphenyl	Congener
4CL2M	40186-70-7	175	2,2',3,3',4,5',6-Heptachlorobiphenyl	Congener
4CL2M	52663-65-7	176	2,2',3,3',4,6,6'-Heptachlorobiphenyl	Congener
4CL2M	52663-70-4	177	2,2',3,3',4,5',6'-Heptachlorobiphenyl	Congener
4CL2M	52663-67-9	178	2,2',3,3',5,5',6-Heptachlorobiphenyl	Congener
4CL2M	52663-64-6	179	2,2',3,3',5,6,6'-Heptachlorobiphenyl	Congener
4CL_PP_2M	35065-29-3	180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Congener
4CL_PP_2M	74472-47-2	181	2,2',3,4,4',5,6-Heptachlorobiphenyl	Congener
4CL_PP_2M	60145-23-5	182	2,2',3,4,4',5,6'-Heptachlorobiphenyl	Congener
4CL PP 2M	52663-69-1	183	2,2',3,4,4',5',6-Heptachlorobiphenyl	Congener

Table B2.1.1.3c Tas	52 5511111401	Current		
Descriptor	CASRN	BZ & IUPAC Number	IUPAC Name	Туре
4CL_PP	74472-48-3	184	2,2',3,4,4',6,6'-Heptachlorobiphenyl	Congener
4CL2M	52712-05-7	185	2,2',3,4,5,5',6-Heptachlorobiphenyl	Congener
4CL2M	74472-49-4	186	2,2',3,4,5,6,6'-Heptachlorobiphenyl	Congener
4CL2M	52663-68-0	187	2,2',3,4',5,5',6-Heptachlorobiphenyl	Congener
4CL2M	74487-85-7	188	2,2',3,4',5,6,6'-Heptachlorobiphenyl	Congener
CP1_4CL_PP_2M	39635-31-9	189	2,3,3',4,4',5,5'-Heptachlorobiphenyl	Congener
4CL_PP_2M	41411-64-7	190	2,3,3',4,4',5,6-Heptachlorobiphenyl	Congener
4CL_PP_2M	74472-50-7	191	2,3,3',4,4',5',6-Heptachlorobiphenyl	Congener
4CL2M	74472-51-8	192	2,3,3',4,5,5',6-Heptachlorobiphenyl	Congener
4CL2M	69782-91-8	193	2,3,3',4',5,5',6-Heptachlorobiphenyl	Congener
4CL_PP_2M	35694-08-7	194	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	Congener
4CL_PP_2M	52663-78-2	195	2,2',3,3',4,4',5,6-Octachlorobiphenyl	Congener
4CL_PP_2M	42740-50-1	196	2,2',3,3',4,4',5,6'-Octachlorobiphenyl	Congener
4CL_PP_2M	33091-17-7	197	2,2',3,3',4,4',6,6'-Octachlorobiphenyl	Congener
4CL2M	68194-17-2	198	2,2',3,3',4,5,5',6-Octachlorobiphenyl	Congener
4CL2M	52663-75-9	199	2,2',3,3',4,5,5',6'-Octachlorobiphenyl	Congener
4CL2M	52663-73-7	200	2,2',3,3',4,5,6,6'-Octachlorobiphenyl	Congener
4CL2M	40186-71-8	201	2,2',3,3',4,5',6,6'-Octachlorobiphenyl	Congener
4CL2M	2136-99-4	202	2,2',3,3',5,5',6,6'-Octachlorobiphenyl	Congener
4CL_PP_2M	52663-76-0	203	2,2',3,4,4',5,5',6-Octachlorobiphenyl	Congener
4CL_PP_2M	74472-52-9	204	2,2',3,4,4',5,6,6'-Octachlorobiphenyl	Congener
4CL_PP_2M	74472-53-0	205	2,3,3',4,4',5,5',6-Octachlorobiphenyl	Congener
4CL_PP_2M	40186-72-9	206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Congener
4CL_PP_2M	52663-79-3	207	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	Congener
4CL2M	52663-77-1	208	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	Congener
	2051-24-3	209	Decachlorobiphenyl	Congener
	27323-18-8		Monochlorobiphenyl	Homolog
	25512-42-9		Dichlorobiphenyl	Homolog
	25323-68-6		Trichlorobiphenyl	Homolog
	26914-33-0		Tetrachlorobiphenyl	Homolog
	25429-29-2		Pentachlorobiphenyl	Homolog
	26601-64-9		Hexachlorobiphenyl	Homolog
	28655-71-2		Heptachlorobiphenyl	Homolog
	55722-26-4		Octachlorobiphenyl	Homolog
	53742-07-7		Nonachlorobiphenyl	Homolog
	12674-11-2		Aroclor 1016	Mixture
	147601-87-4		Aroclor 1210	Mixture
	151820-27-8		Aroclor 1216	Mixture
	11104-28-2		Aroclor 1221	Mixture
	37234-40-5		Aroclor 1231	Mixture
	11141-16-5		Aroclor 1232	Mixture

Table B2.1.1.3c Task 3B continued					
Descriptor	CASRN	Current BZ & IUPAC Number	IUPAC Name	Туре	
	71328-89-7		Aroclor 1240	Mixture	
	53469-21-9		Aroclor 1242	Mixture	
	12672-29-6		Aroclor 1248	Mixture	
	165245-51-2		Aroclor 1250	Mixture	
	89577-78-6		Aroclor 1252	Mixture	
	11097-69-1		Aroclor 1254	Mixture	
	11096-82-5		Aroclor 1260	Mixture	
	37324-23-5		Aroclor 1262	Mixture	
	11100-14-4		Aroclor 1268	Mixture	
	12767-79-2		Aroclor (unspecified)	Mixture	
	1336-36-3		Polychlorinated biphenyl (PCB)	Category	

Table 7: Fish Tissue Chemistry Polychlorinated Dioxins and Furans.

TASK 3C POLYCHLORINATED DIOXINS AND FURANS TARGET PARAMETER LIST (TPL)

Method 1613 Rev. B (U.S. EPA 1994a)

		BIOLOGIC	AL	SEDIMEN	IT .
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
2,3,7,8-TCDF	51207-31-9	1.0	ng/kg	1.0	ng/kg
2,3,7,8-TCDD (Dioxin)	1746-01-6	1.0	ng/kg	1.0	ng/kg
1,2,3,7,8-PeCDF	57117-41-6	2.5	ng/kg	2.5	ng/kg
2,3,4,7,8-PeCDF	57117-31-4	2.5	ng/kg	2.5	ng/kg
1,2,3,7,8-PeCDD	40321-76-4	2.5	ng/kg	2.5	ng/kg
1,2,3,4,7,8-HxCDF	70648-26-9	5.0	ng/kg	5.0	ng/kg
1,2,3,6,7,8-HxCDF	57117-44-9	5.0	ng/kg	5.0	ng/kg
2,3,4,6,7,8-HxCDF	60851-34-5	5.0	ng/kg	5.0	ng/kg
1,2,3,4,7,8-HxCDD	39227-28-6	5.0	ng/kg	5.0	ng/kg
1,2,3,6,7,8-HxCDD	57653-85-7	5.0	ng/kg	5.0	ng/kg
1,2,3,7,8,9-HxCDD	19408-74-3	5.0	ng/kg	5.0	ng/kg
1,2,3,7,8,9-HxCDF	72918-21-9	5.0	ng/kg	5.0	ng/kg
1,2,3,4,6,7,8-HpCDF	67562-39-4	5.0	ng/kg	5.0	ng/kg
1,2,3,4,6,7,8-HpCDD	35822-46-9	5.0	ng/kg	5.0	ng/kg
1,2,3,4,7,8,9-HpCDF	55673-89-7	5.0	ng/kg	5.0	ng/kg
OCDD	3268-87-9	5.0	ng/kg	5.0	ng/kg
OCDF	39001-02-0	5.0	ng/kg	5.0	ng/kg

wet weight basis dry weight basis

TCDD = Tetrachlorodibenzo-dioxin TCDF = Tetrachlorodibenzofuran PeCDD = Pentachlorodibenzo-p-dioxin PeCDF = Pentachlorodibenzofuran HxCDD = Hexachlorodibenzo-p-dioxin HxCDF = Hexachlorodibenzofuran HpCDD = Heptachlorodibenzo-p-dioxin HpCDF = Heptachlorodibenzofuran OCDD = Octachlorodibenzo-p-dioxin OCDF = Octachlorodibenzofuran

ng/kg (ww)=nanograms per kilogram wet weight basis

Table 8: Fish Tissue Chemistry Organochlorine Pesticides.

TASK 5 ORGANOCHLORINE PESTICIDES TARGET PARAMETER LIST (TPL)

Method 8081A (U.S. EPA 1996b)

		BIOLOGICAL		SEDIMEN	IT
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
Aldrin	309-00-2	2.5	μg/kg	2.5	μg/kg
BHC, alpha-	319-84-6	2.5	μg/kg	2.5	μg/kg
BHC, beta-	319-85-7	2.5	μg/kg	2.5	μg/kg
BHC, delta-	319-86-8	2.5	μg/kg	2.5	μg/kg
BHC, gamma-	58-89-9	2.5	μg/kg	2.5	μg/kg
Chlordane, gamma(trans)	5103-74-2	2.5	μg/kg	2.5	μg/kg
Chlordane, alpha(cis)	5103-71-9	2.5	μg/kg	2.5	μg/kg
DDD, o,p'-	53-19-0	2.5	μg/kg	2.5	μg/kg
DDD, p,p'-	72-54-8	5.0	μg/kg	5.0	μg/kg
DDE, o,p'-	3424-82-6	2.5	μg/kg	2.5	µg/kg
DDE, p,p'-	72-55-9	5.0	μg/kg	5.0	μg/kg
DDT, o,p'-	789-02-6	2.5	μg/kg	2.5	μg/kg
DDT, p,p'-	50-29-3	5.0	μg/kg	5.0	μg/kg
Dieldrin	60-57-1	5.0	μg/kg	5.0	μg/kg
Endosulfan I	959-98-8	2.5	μg/kg	2.5	μg/kg
Endosulfan II	33213-65-9	5.0	μg/kg	5.0	μg/kg
Endosulfan sulfate	1031-07-8	5.0	μg/kg	5.0	μg/kg
Endrin	72-20-8	5.0	μg/kg	5.0	μg/kg
Endrin aldehyde	7421-93-4	5.0	μg/kg	5.0	μg/kg
Endrin ketone	53494-70-5	5.0	μg/kg	5.0	μg/kg
Heptachlor	76-44-8	2.5	μg/kg	2.5	μg/kg
Heptachlor Epoxide	1024-57-3	2.5	μg/kg	2.5	μg/kg
Hexachlorobenzene	118-74-1	2.5	μg/kg	2.5	μg/kg
Methoxychlor	72-43-5	25.0	μg/kg	25.0	μg/kg
Mirex	2385-85-5	5.0	μg/kg	5.0	μg/kg
cis- Nonachlor	5103-73-1	5.0	μg/kg	5.0	μg/kg
trans- Nonachlor	39765-80-5	5.0	μg/kg	5.0	μg/kg
Oxychlordane	27304-13-8	5.0	μg/kg	5.0	µg/kg
Pentachloroanisole	1825-21-4	2.5	μg/kg	2.5	µg/kg
Toxaphene	8001-35-2	75.0	µg/kg	75.0	μg/kg

* wet weight basis

μg/kg micrograms per kilogram

^{**} dry weight basis

Table 9: Fish Tissue Chemistry Cd, Pb, Hg, and Se.

TASK 6 INORGANICS TARGET PARAMETER LIST (TPL)

Method 6020 (U.S. EPA 1994b)

		BIOLOGICAL		SEDIMENT	
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
Cadmium	7440-43-9	10.0	μg/kg	200.0	μg/kg
Lead	7439-92-1	70.0	μg/kg	500.0	μg/kg
Mercury	7439-97-6	20.0	μg/kg	20.0	μg/kg
Selenium	7782-49-2	100	μg/kg	500	μg/kg

^{*} wet weight basis** dry weight basis

μg/kg micrograms per kilogram

Table 10: Fish Tissue Chemistry Metals Long List.

TASK 6B INORGANICS TARGET PARAMETER LIST (TPL)

Method 6020 (U.S. EPA 1994b)

		BIOLOGIC	AL	SEDIMEN	IT
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
Aluminum	7429-90-5	5,000	μg/kg	1,500	μg/kg
Antimony	7440-36-0	2,000	μg/kg	1,000	µg/kg
Arsenic	7440-38-2	1,000	μg/kg	2,000	µg/kg
Barium	7440-39-3	5,000	μg/kg	1,500	μg/kg
Beryllium	7440-41-7	500	μg/kg	1,500	μg/kg
Cadmium	7440-43-9	10.0	μg/kg	200	µg/kg
Calcium	7440-70-2	500,000	μg/kg	5,000	µg/kg
Chromium	7440-47-3	100	μg/kg	800	μg/kg
Cobalt	7440-48-4	5,000	μg/kg	200	μg/kg
Copper	7440-50-8	100	μg/kg	500	μg/kg
Iron	7439-89-6	5,000	μg/kg	5,000	µg/kg
Lead	7439-92-1	70.0	μg/kg	500	μg/kg
Magnesium	7439-95-4	500,000	μg/kg	3,000	μg/kg
Manganese	7439-96-5	1,500	μg/kg	200	μg/kg
Mercury	7439-97-6	20.0	μg/kg	20.0	μg/kg
Nickel	7440-02-0	1,000	μg/kg	250	µg/kg
Potassium	7440-09-7	500,000	μg/kg	60,000	µg/kg
Selenium	7782-49-2	100	μg/kg	500	μg/kg
Silver	7440-22-4	500	μg/kg	200	µg/kg
Sodium	7440-23-5	10,000	μg/kg	6,000	μg/kg
Thallium	7440-28-0	1,000	μg/kg	500	µg/kg
Vanadium	7440-62-2	2,000	μg/kg	1,000	μg/kg
Zinc	7440-66-6	2,000	μg/kg	500	μg/kg

* wet weight basis** dry weight basis

μg/kg micrograms per kilogram

Table 11: Fish Tissue Chemistry Total Mercury and Methylmercury.

TASK 6F Total Mercury Methyl Mercury

Method 1630 (U.S. EPA 1998b) Method 1631, Rev. E (U.S. EPA 2001)

Preparation for Method 1631E: Digestion I, Appendix to Method 1631: Total Mercury in Tissue, Sludge, Sediment, and Soil by Acid Digestion and BrCl Oxidation. (U.S. EPA 2002)

		BIOLOGICAL		SEDIMENT	
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
Mercury	7439-97-6	1.0	μg/kg	1.0	μg/kg
Methyl Mercury	22967-92-6	1.0	μg/kg	1.0	μg/kg

NA Not Applicable.

* wet weight basis

** dry weight basis

µg/kg micrograms per kilogram

Table 12: Fish Tissue Chemistry Acid Extractable Polynuclear Aromatic Hydrocarbon Compounds.

TASK 10 POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) TARGET PARAMETER LIST (TPL)

Method 8270C (SIM) (U.S. EPA 1996d)

		BIOLOG	CAL	SEDIME	NT
PARAMETER	CAS NUMBER	CRQL	UNITS*	CRQL	UNITS**
Naphthalene	91-2-03	100	μg/kg	33.0	μg/kg
1-Methyl Naphthalene	90-12-0	100	μg/kg	16.0	μg/kg
2-Methyl Naphthalene	91-57-6	100	μg/kg	16.0	μg/kg
Acenaphthylene	208-96-8	125	μg/kg	67.0	μg/kg
Acenaphthene	83-32-9	50.0	μg/kg	33.0	μg/kg
Fluorene	86-73-7	10.0	μg/kg	3.3	μg/kg
Phenanthrene	85-01-8	5.0	μg/kg	3.3	μg/kg
Anthracene	120-12-7	7.5	μg/kg	3.3	μg/kg
Chrysene	218-01-9	5.0	μg/kg	3.3	μg/kg
Fluoranthene	206-44-0	7.5	μg/kg	5.0	μg/kg
Pyrene	129-00-0	2.0	μg/kg	3.3	μg/kg
Benzo (a) anthracene	56-55-3	5.0	μg/kg	3.3	μg/kg
Benzo (b) fluoranthene	205-99-2	5.0	μg/kg	3.3	μg/kg
Benzo (k) fluoranthene	207-08-9	5.0	μg/kg	3.3	μg/kg
Benzo (a) pyrene	50-32-8	10.0	μg/kg	3.3	μg/kg
Dibenzo (a,h) anthracene	53-70-3	15.0	μg/kg	6.7	μg/kg
Benzo (g,h,i) perylene	191-24-2	12.5	μg/kg	6.7	μg/kg
Indeno (1,2,3-c,d) Pyrene	193-39-5	7.5	μg/kg	6.7	µg/kg

NA Not Applicable.

* wet weight basis

** dry weight basis

μg/kg micrograms per kilogram

Table 13: Laboratory Charges by Analytical Task Group

Task#	Description	Bio 60 Day Reporting Time	Bio 30 Day Reporting Time	Sediment 60 Day Reporting Time	Sediment 30 Day Reporting Time
1	Percent Lipid	\$65.00	\$65.00	N/A	N/A
3	Total PCBs	\$145.00	\$145.00	N/A	N/A
3B	PCB Congeners	\$785.00	\$785.00	\$770.00	\$770.00
3C	Dioxins and Furans	\$700.00	\$700.00	\$685.00	\$685.00
5	Organochlorine Pesticides	\$180.00	\$180.00	\$115.00	\$140.00
3,5	Total PCB and Organochlorine Pesticides	\$200.00	\$210.00	N/A	N/A
1,3,5	Lipid, Solids, Total PCB and Organochlorine Pesticides	\$205.00	\$225.00	N/A	N/A
6	Metals Short List	\$80.00	\$85.00	\$75.00	\$75.00
6B	Metals Long List	\$165.00	\$195.00	\$175.00	\$175.00
6F	Total and Methyl-Mercury by Method 1631 Appendix	\$245.00	\$265.00	N/A	N/A
10	Polynuclear Hydrocarbons	\$145.00	\$180.00	\$95.00	\$130.00

III. ASSESSMENT/OVERSIGHT

Field and laboratory performance and system audits will be conducted to ensure good quality data. The field and laboratory performance includes precision measurements by relative percent difference (RPD) of field and laboratory duplicate (IDEM 2004, pp 41, 45-46) and accuracy measurements by percent of recovery of matrix spike and matrix spike duplicate (MS/MSD) samples analyzed in the laboratory (IDEM 2004, pp 42-43, 45-46), and completeness measurements by the percent of planned samples that are actually collected, analyzed, reported, and usable for the project (IDEM 2004, p 43).

Field audits will be conducted to ensure that sampling activities adhere to WAPB SOPs. Audits are systematically conducted by WAPB Quality Assurance staff to include all WAPB personnel that engage in field sampling activities. WAPB field staff involved with fish tissue sample collection and preparation will be evaluated by QA staff trained in the associated sampling SOPs, and in the processes related to conducting an audit. QA staff will produce an evaluation report documenting each audit for review by those field staff in which the audit pertains, as well as WAPB management. Corrective actions will be communicated and implemented by field staff as a result of the audit process.

Data Quality Assessment Levels

The samples and various types of data collected by this program are intended to meet the quality assurance criteria and DQA Levels as described in the WAPB QAPP (IDEM 2004, pp 128-129). All fish tissue contaminants analytical results for this project will adhere to DQA Level 4.

IV. DATA VALIDATION AND USABILITY

Quality assurance reports to management, including data validation and usability, are also important components of the QAPP to ensure good quality data for this project. A quality assurance audit report will be submitted for this project should problems arise and need to be investigated and corrected (IDEM 2004, pp 132-133). Data validation and usability will be achieved through data reduction (the process of converting raw analytical data into final results in proper reporting units), data validation (the process of qualifying analytical/ measurement data on the performance of field and laboratory quality control measures incorporated into the sampling and analysis procedures), and data reporting (the detailed description of the data deliverables used to completely document the calibration, analysis, quality control measures, and calculations).

Quality Assurance/Data Qualifiers and Flags

The various data qualifiers and flags that will be used for quality assurance and validation of the data are found on pages 130-131 of the WAPB QAPP (IDEM 2004).

Data Usability

The environmental data collected and its usability are finally qualified and classified into one or more of the four Categories: Acceptable Data, Enforcement Capable Results, Estimated Data and Rejected Data as described on page 130 of the WAPB QAPP (IDEM 2004).

Reports of analytical results will be produced by IDEM based on the data collected in 2016:

- One report will be a general compilation of the 2016 West Fork White River and Patoka Basins fish tissue contaminants results presented to the Indiana FCA Workgroup and to the 305(b)/303(d) Integrated Report Coordinator.
- A second data assessment report will be produced using the 2016 data for the Indiana FCA workgroup to be used for decision-making purposes.

- 3) A third data assessment report will be produced for decision-making inclusion in the Integrated Report.
- 4) A fish collection report will be submitted to the IDNR DFW in January of 2017 as a condition of the Program Manager's Scientific Purposes Collecting Permit issued by IDNR.
- 5) Other reports assessing various aspects of fish tissue contaminants data will be produced depending on time and indications by the data, as well as special requests. These may include further refinement of statewide mercury assessments for individual fish species contaminant models, an assessment of brominated diphenyl ether compounds in fish, and a trend assessment of organochlorine pesticides in fish from across the state.

All data and reports will be made available to public and private entities who may find the data useful for municipal, industrial, agricultural, and recreational decision-making purposes (TMDL, NPDES permit modeling, Site Investigations, Natural Resources Damage Assessment, Watershed Restoration Projects, Water Quality Criteria refinement, health information, etc.).

Laboratory and Estimated Cost

Laboratory analysis and data reporting for this project will comply with the QAPP for Indiana Surface Water Quality Monitoring and TMDL Program, Revision 3, 10/2004 (IDEM 2004) and RFP 12-68 (IDEM 2012c). Analytical tests on the parameters outlined in Tables 4 through 12 will be performed by Pace Analytical, Inc. of Green Bay, WI under contract ARN A305-3-7 (IDOA 2013). Supplies for the fish tissue sampling, including aluminum foil and food grade zip lock bags for wrapping tissue samples and dry ice and coolers for shipping, will be provided by Pace Analytical, Inc. The anticipated budget for laboratory cost in 2016 is \$136,000 (Table 20). The projected laboratory expenditures for 2016 are based on samples collected from 45 sites in the West Fork White River and Patoka basins, on the GCR, and in the Indiana waters of southern Lake Michigan. The 60-day reporting time is the standard reporting time for the program for cost efficiency purposes. The 30-day reporting time is reserved for special studies that may arise, in which the results are time sensitive. The standardized tasks assigned to fish tissue samples include tasks 1, 3, 5, 6, and 6F. Task assignments are highly variable and are determined based on region, known contaminants of concern, budgetary constraints, and can be sample-, species-, or waterbody-specific. For the projected sampling sites in this workplan, samples from all sites will be analyzed for tasks 1, 3, 5, 6, and 6F with the following exceptions:

- Salmonid species from the southern portion of Lake Michigan will be analyzed for tasks 1, 3, 5, 6B, 6F, and 10.
- Samples from the Grand Calumet River will be analyzed for tasks 1, 3, 5, 6B, and 10. In addition, task 3C will be analyzed from one sample per site.

Table 14: Provisional Laboratory Expenditures for 2016

	Cost Per	#	Lab		
Tasks	Sample	Samples	Duplicates	MS/MSD	Total
1,3,5,6,6F	\$530.00	174	10	20	\$107,820.00
1,3,5,6B,6F,10	\$615.00	10	1	2	\$7,365.00
1,3,5,6B,10	\$515.00	16	NA	NA	\$8,240.00
1,3,3C,5,6B,10	\$1,215.00	4	2	4	\$12,090.00

Total: \$135,515.00

Laboratory Competency and Certifications

The Green Bay lab of Pace Analytical, Inc. offers organic and inorganic analysis, as well as a broad range of specialty services, including low level mercury, U.S. EPA Contract Lab Program level packages and electronic deliverables. In addition to routine environmental matrices, the Green Bay laboratory has expertise in sediment work, biological tissue analysis and emergency response capability. The Green Bay laboratory holds a broad base of analytical certifications in numerous programs (e.g., National Environmental Laboratory Accreditation Program (NELAP)), and is certified in Wisconsin, Illinois and other states.

Dioxin and PCB congener analysis is performed at the Minneapolis Lab of Pace Analytical, Inc. Methyl mercury analysis using method 1630 is performed at the Duluth, MN Lab of Pace Analytical, Inc. There is no certification available for this method. All labs maintain multiple accreditations and are accredited to ISO 17025:2005 by the American Association for Laboratory Accreditation (AALA) and/or NELAP. Pace Analytical's certifications cover the following U.S. EPA test methods:

- Method 8082
- Method 8081A/B
- Method 8270C
- Method 6020
- Method 1631E
- Method 1613B
- Method 1668A

Certification for the Green Bay lab issued by the Florida Department of Health (Certificate #E87948) expires June 30, 2016. The lab is in the process of renewing that certificate. The MN lab, A2LA Certificate Number 2926.01, was last audited August 10-14, 2015. NELAP Certification from Minnesota Department of Health for the Duluth lab (Certificate Number: 1057744) is effective May 3, 2016.

Table 15: Personnel Safety and Reference Manuals

Role	Required Training/Experience	Training References	Training Notes
All staff participating in fish tissue sample collections	-Basic First Aid and Cardio-Pulmonary Resuscitation (CPR)	-A minimum of 4 hours of in-service training provided by WAPB (IDEM 2010b)	-Staff lacking 4 hours of in-service training or appropriate certification will be accompanied in the field at all times by WAPB staff that meet Health and Safety Training requirements
	-Personal Protective Equipment (PPE) Policy -Memorandum "Use of Personal Flotation Devices (PFD) by Branch Personnel" dated February 29, 2000	-IDEM 2008 -February 29, 2000 WAPB internal memorandum regarding use of approved PFDs	-Indiana Code 14-8-2- 27 requires a high intensity whistle and Safety of Life at Sea (SOLAS) certified strobe light when working on co- jurisdictional waters or during hours of darkness
	-IDEM Injury and Illness Resulting from Occupational Exposure Policy -Compliance with the former Biological Studies Section (BSS) Standard Operating Procedures Manual: Section II	-Hazard Communication Manual (IDEM 1992d)	
	-Compliance with Indiana boating safety requirements	-State of Indiana Boating Safety Requirements (U.S. PS 2016) and the DNR approved online Boating Safety Course	-Staff lacking 2 years field experience will be accompanied in the field at all times by WAPB staff that meet the boating safety requirements

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Appendix 1. Field Record for Biological Tissue Contaminants Monitoring Program

<u>Fiel</u>	d Record for	Biological	Tissue Contam	inant Mon	itoring Pr	<u>ogram</u>
Site ID #:			Sampling Date and	Time:		
Event ID:		************	, , , , , , , , , , , , , , , , , , , ,		n/dd/yyyy)	(24hr olock)
SITE LOCATION						
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County		ripscode	Lat./La			
Location: Segment Number:	Engaging	Urcal	ralagia I Init			
Segment Number: Waterbody Type:	EcoteSton:	nyu r aren	RESER		WETL	
Site Description:						
Collection Method:			миллениялиналиналиналиналиналина	***************************************		
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Agency:			Phone:()			
FISH (or other org	ŕ					
Composite Sample #						
Species Name:			,			
Sample Preparation:				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
	mm) Weight(gm)	Sex(M,F)	Fish#	Length(mm)	Weight(gm)	Sex(M,F)
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			009		***************************************	NAMES AND ADDRESS OF THE PARTY
			010	***************************************		

006			012			
(min length/max len					igth	
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Notes (e.g., DELT a	nomalies)				*******************************	
Composite Sample #	:		_Number of Individ	luals:	Lab ID	
Species Name:	***				······································	
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Appendix 2. Contract Laboratory Chain of Custody Form

CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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Section A Section B Required Client Information: Required Project Company: Report To: Address: Copy To:					Required Project Information:							Section C Invoice Information:															Р	age:			of		
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